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[Agricultural development in Botswana: targets and constraints.

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AGRICULTURAL DEVELOPMENT
IN BOTSWANA:
TARGETS AND CONSTRAINTS

DR. HOYT ALVERSON

IDM PUBLIC LECTURE

NOVEMBER 23, 1978

Botswana
Lesotho
Swaziland

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F O R E W O R D

This second IDM evening Public Lecture Series which ran from October 1977 to November 1978 was organized under my predecessor, Dr. George Haythorne. As with the first Series, each of the five lectures deals with an important aspect of development.

Since there are inevitably delays in acquiring and printing a full set of five lectures and since the topics will have interest to different groups it was felt that more timely publication of individual lectures would better serve the purpose of communicating the contents of these lectures to a wider audience.

Dr. Hoyt Alverson from Dartmouth College, USA was on the staff of the IDM from June to December 1978 with funding provided by USAID. Dr. Alverson worked closely with the officials of the Botswana Government responsible for the development of an arable lands policy and this lecture deals with a number of crucial questions that have to be faced in the articulation of an agricultural development policy. The views expressed, of course, are those of Dr. Alverson.

Fred Schindeler
Director.

AGRICULTURAL DEVELOPMENT IN BOTSWANA

TARGETS AND RESTRAINTS

Hoyt Alverson[x]

Preface

In this paper, which is essentially a transcription of a public lecture, I shall attempt to outline some of the major issues entailed in a national effort to develop agriculture in Botswana. In this context, many assumptions and suppositions, which cannot always be fully described and defended, must be made in order effectively to communicate. In part, this intentional limitation follows from the desire to write in a fashion that will engage the interest of the non-specialist, yet at the same time be informative for the specialist as well. This is a hazardous undertaking, for in it one risks that simplification which specialists find distasteful, and that complexity which "practical" people find cumbersome or pedantic. Admittedly, these caveats and apologies hardly benefit the reader, but they do protect the purport of this talk from facile criticism. Constructive criticism and discussion are, however, most eagerly sought and welcomed.

I should like to acknowledge here the benefit and contribution to this paper made possible by my collaboration with Dr. K. Oland in the task of formulating national targets for the "Arabic-Lands Development Policy". Much of what has been written here follows from our joint work. Needless to say, in all that follows, any errors of omission or commission are my responsibility alone.

Government's Plans and Policies

Botswana's Fourth National Development Plan has proffered four major goals in each of which the agricultural sector is expected to play a prominent role: (a) attainment of self-sufficiency in production of essential staple crops, (b) providing secure and adequate livelihoods for Batswana, (c) elimination of political and economic dependence on Rhodesia and South Africa, and (d) saving (earning) foreign exchange.

To date, these goals have remained but visions, a long way from realization. The agricultural sector (except for beef export) has made no progress during the plan period towards their attainment. The Ministry of Finance and Development Planning, in its keynote paper for National Development Plan V, reflects this fact in its statement that "the two major problems to be faced during the period of National Development Plan (No. 5), are the lack of productive employment and the need for rural development". The document continues: "the share of government resources presently going to the provision of social services and physical infra-structure is too high and more must be devoted to productive activities especially arable agriculture and industry".

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There are about 17,000 new members added to the labour force each year. Yet the number of new jobs being created per year is currently about 5,000. Says the Ministry of Finance and Development Planning, "The major source of new work will have to be the agricultural sector. No other sector offers such an opportunity to the bulk of the population of increasing not only the level of consumption of their own produce, but also the production of saleable commodities."

The need to create new jobs, especially in the farming sector, is echoed in the National Development Plan (No. 5) keynote paper of the Ministry of Local Government and Lands, "One of the two policy issues presented in this Ministry's keynote paper for National Development Plan (No. 4) was to reduce migration from remote rural areas to large villages and towns. This has not been achieved. It remains a key policy issue for National Development Plan (No. 5)."

While there appears to be consensus within government concerning the scope and scale of the problems of rural "underemployment," and the need to dramatically increase arable production, there does not appear to be agreement concerning the means to rectify the problems. For example, the Ministry of Agriculture sees the need to provide reliable water supplies in lands areas as necessary to achieve substantial growth in agriculture. The Ministry of Mineral Resources and Water Affairs, for their part, question the practicability of this idea and indeed, in their keynote paper for the Fifth National Development Plan, make no mention at all of water development.

The Ministry of Agriculture hopes to create 7,000 - 10,000 jobs in the agricultural sector during the five-year period 1979-1984. Yet the total number of jobs needed during this period (including self-employment) is going to be at least 75,000, including a large number to absorb the expected demand for work created by rapid diminution in migratory labour to South Africa.

Despite disagreement over means, Government appears to be committed to the goal of immediate and dramatic development of agriculture. What are the constraints affecting pursuit of this end, the resources that can be harnessed, the current conditions of agriculture and the specific targets which must be set in order to define and measure progress towards this goal?

Socio-Economic Background

The population of Botswana is currently somewhat greater than 3/4 million and is growing at an annual rate in excess of 3 percent. By the year 2000, the population will exceed 1.6 million. The number of rural dwelling households is variously estimated to be between 80,000 and 100,000. The number actively engaged in some form of arable or stock farming is substantially less than the total. It may be assumed from several studies that at least 10 percent of rural households do not farm, do so irregularly, or on a negligibly small scale.

Fifty-eight percent of rural households cultivate fewer than four hectare of land; 87 percent cultivate fewer than eight hectare.

The median computed "gross available income" for rural households is less than the "poverty datum line" as computed for the average-sized rural household of 6.2 persons. Mean income per capita of rural dwellers is about P160 per annum. More than one-half of current active farming households depend upon borrowed, exchanged, or mafisa'd draft power in some measure in order to plough. Between 30 and 40 percent of active farmers lack demand-rights of any kind to cattle for draft power.

The urban population was estimated in 1971 to be 59,460. The current (1978) estimated urban population of Botswana exceeds 100,000. This population is said to be growing at 13 percent per annum. This trend is expected to continue over the next several years. If this rate of urban increase persists for ten years, the urban population in 1988 will have reached 383,500. This will represent an increase in the proportion of the population which is urban from about 14 percent to about 38 percent.

Mine labour migration reached a peak in 1976 with over 40,000 individuals recruited from Botswana. There appears to be some reduction in these numbers for the past two years. Still, the annual numbers of miners recruited currently equals about 1/2 - 2/3 of the total number in formal sector employment within the country. The economic import of this migration is substantial. Actuarially, half the rural households send one member to the mines per year. For 1976 some 37,000 mine employees from Botswana earned 32,000,000 Pula and repatriated over P500,00 per capital in cash and kind. Mine migrants' wages each year exceed 20 percent of all formal sector compensation for the whole of Botswana.

Minimum wages available in town (P480 per annum) and/or compensation for nine months mine contract (ave. = R869 in 1976) must be seen as one measure of opportunity cost for an individual's electing to farm in rural areas. Formal sector wages currently average (1978) more than P2,000.00 per worker. This is more than three times the median rural household income.

These few figures suggest directly that there exists a large gap or disparity between the incomes, wealth, and life-chances of rural, subsistence or sub-subsistence farming households and urban, "formal sector" households. This gap has been growing and shows no sign of being closed in the near future. Table I illustrates this point. While the heights of these curves are an important datum, the principal issue lies in the discrepant slopes of these curves. Rural incomes are not rising as rapidly as the per-capita wealth production of the country as a whole. Formal sector wages are rising much more rapidly than is the wealth of the country as a whole. The inescapable conclusion is that the wealth of the country is now maldistributed and change is in the direction of rapidly increasing maldistribution. Can development of agriculture succeed in reversing these trends as well as lead to attainment of the other interrelated goals cited above?

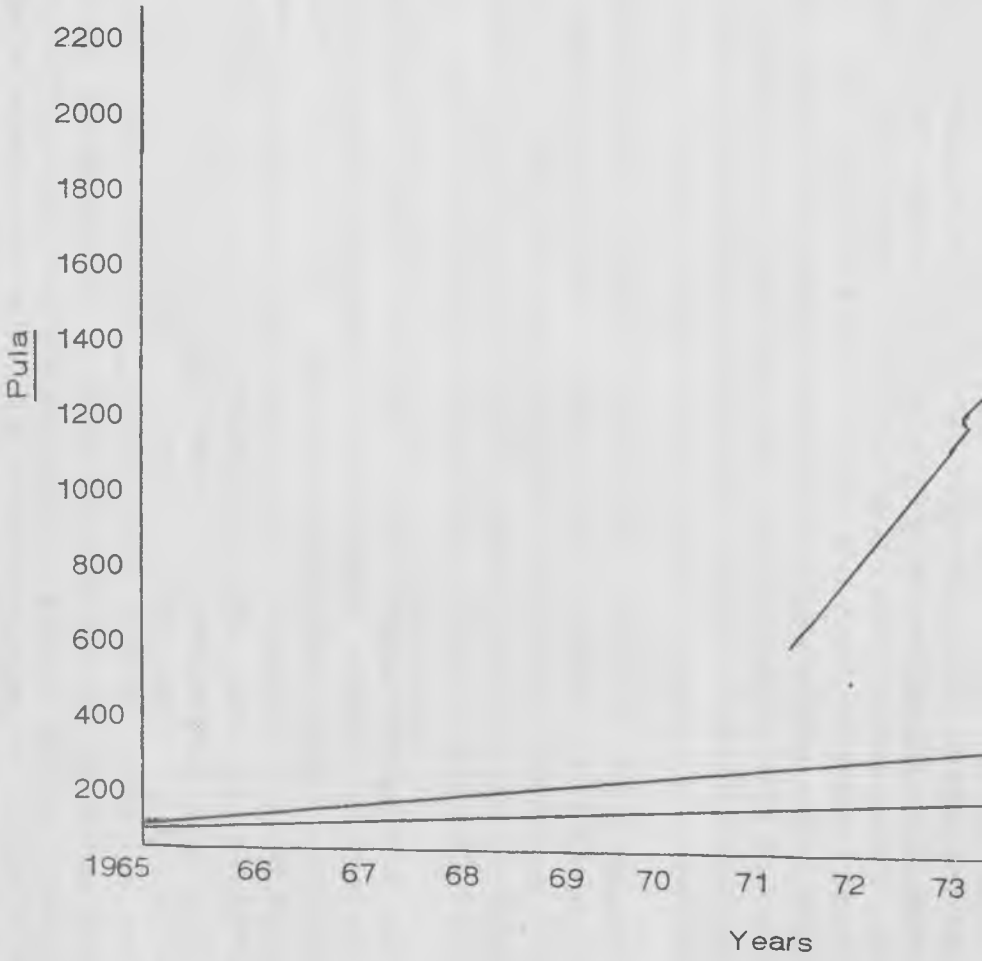
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
Pula
1965
66
67
68
69
70
71
72
73
Years

TABLE 1

Average formal
sector wages
Per capita GDP
Rural per
capita income
74
75
76
77
78

Current Conditions of Agriculture

Production of cereal crops over the past ten years varies markedly as a function of rainfall. Annual per hectare yields of sorghum and maize range from lows of 65 and 55 kgs. respectively to highs of 455 and 435 kgs. respectively. The highest recorded aggregate yield of cereals in Botswana in the past ten years constitutes about half the annual minimum nutritional demand for the current population as a whole (see below). The mean per hectare yields for cereals over the past ten years (280 kgs.) grown on three hectare (the mean household hectarage) provide a crop which is about half that required to meet coloric minima for the "average" rural family of 6.2 persons.

The value of crop production constitutes about 11 percent of the gross available income of the poorest 10 percent of rural households, 9 percent of the households in the 15th to 50th percentiles of households ranked by gross available income, 4 percent of households in the 60th to 95th percentiles, and 0 percent of the richest 5 percent of households. For all but the richest 5 percent of rural households, the value of income from either formal employment or from cash transfers into the household exceeds the value of crop production. In most income strata (all but the richest 5 percent), the combined value of income from formal employment and wage transfers exceeds the value of crop production by a factor of at least four and typically by a factor of ten.

Agriculture (including livestock farming) accounts for about one-quarter of the gross domestic product and about 6 percent of all formal employment. Of the GDP traced to income (i.e., compensation), agriculture contributes 13.6 million Pula or about 11.5 percent.

It is solely because of the current value of meat exports that Botswana is a net exporter of food-stuffs. Despite this, Botswana is importing increasingly large proportions of her basic foods. In 1975 over 54,000 tons of cereal were imported; in 1976 over 65,000 tons; in 1977 over 100,000 tons. These imports testify to the fact that no more than one-quarter of Botswana's current farming households ever harvest a crop which meets the total household demand for (1) caloric minima, (2) for operating costs such as wages and seeds, and (3) for a replacement fund. These facts lie behind current massive migration to large villages, towns, and the mines by rural people.

Thus, 46 percent of rural households have at least one wage-earner. The vast majority of these are in Botswana's towns or in the South African mines. Urban and mine migration must be seen as a direct result of the failure of agriculture to sustain acceptable incomes.

Nutrition: A Note

It is popularly believed in Botswana that the population as a whole enjoys a rather good diet. While parts of Africa have less adequate diets, the population of Botswana, especially the poorer half, both urban and rural, are

undernourished and improperly nourished. The FAO Fourth World Food Survey reports that the population (in aggregate) obtains less than 90 percent of stipulated minimum calorie requirements per capita per day. Said differently, the percentage of the population with caloric intake below the critical limit of 120 percent of the average basal metabolic rate exceeds 200,000. This was one-third of the population for the years 1969 - 1974 in which the sampling was undertaken. Protein intake is very high for some Batswana (e.g., herd boys living off milk, and holders of large numbers of stock or fowl who eat regularly part of the offtake). But for the majority of Batswana, protein intake is probably less than 50 grams per day. The population does not obtain sufficient quantities of vitamins and minerals from green or yellow vegetables and from fruits, especially during the dry season.

The Efficiency of Traditional Agriculture

The stark and undeniable shortcomings of current agriculture raise the question: Is Botswana's traditional agricultural practice incredibly inefficient? The answer is clearly no. While the total product of the traditional regime falls seriously short of national need and demand, it cannot -- indeed, must not be concluded that the system of production is inefficient. Efficiency is a concept which refers to the relationship between the energy input into a system and the energy output of the system. In general, hunting and gathering, hoe agriculture, and traditional plough agriculture are more efficient than modern, capital intensive agri-business. While the effectiveness of modern agri-business in producing large quantities of food cannot be denied, it must be remembered that this large product is the result of massive energy inputs. For example, in the potato industry of the state of Washington in the United States, between 8 and 12 kilo-calories of energy input are required to derive 1 kilo-calorie of energy output in the form of starch. Among the Tsembaga, a people of highland New Guinea whose principal cultigen is the yam which is grown in a system of hoe cultivation, land is cleared, planted for some years, then allowed to revert to forest. This Tsembaga "slash and burn" horticulture requires 1 kilo-calorie of energy input to derive 11 kilo-calorie of energy output in the form of starch. While in Washington state the number of calories produced per hectare is double that of New Guinea, the energy input required to obtain that doubled yield is between 80 and 120 times greater.

In principle, this argument applies to all crop types, including cereals. In an era where energy is rapidly rising in costs, Botswana should be very aware of the real costs entailed in attempts to raise agricultural production by massive piece-meal increases in energy inputs.

Targets for Self-Sufficiency in Cereals

The national annual per capita cereals requirement for developing countries has been established by FAO as 250 kgs. Using this figure, Botswana has a current national requirement of about 200,000 tons, made up of approximately 50 percent sorghum, 30 percent maize, and 20 percent wheat. In the years of best aggregate cereals yield, Botswana has produced herself about half this amount.

By the year 2000 the population will have doubled, and the per capita demand will have increased by about 50 to 60 percent. The latter increase will be traceable to decreased milling-out rates, greater use of cereals in feeding stock, poultry, etc., and changes in proportions of cereals in demand. The national demand by the year 2000 will be 600,000 tons, made up of approximately 440,000 tons of sorghum, 240,000 tons of maize, and 100,000 tons of wheat.

To achieve national self-sufficiency, agricultural policy must aim at a rapidly moving target. The year 2000 target is more than five times Botswana's best annual production to date.

To achieve this goal, Botswana must dramatically increase its per hectare yields of cereals or increase the hectarage under cultivation or a combination of both. Current studies suggest that a doubling of cereals yields over traditional averages is about as much as can be accomplished by simple modifications of the traditional system. Therefore, in the short run, it would seem prudent to double on average per hectare yields of cereals and seek to more than double the hectarage under cultivation with cereal crops. If capitalization of small farms proves economic, and trebling or quadrupling of yields is possible, then a modest increase in hectarage will be required.

At the level of the household, self-sufficiency requires an annual cereals harvest of no less than 300 kgs. per full-time household dependent. This figure includes components for caloric minima, seeding rates, milling-out rates, "surpluses" for compensating casual labour, and a contribution to a capital "replacement" fund. The average rural household (n = 6.2) would have to harvest an annual minimum of 1,860 kgs. to meet this target. The current rural household cultivating between three and four hectare, and harvesting the "average" yield of less than 300 kgs. per hectare is obtaining only about one-half to two-thirds of this subsistence minimum on average. Given these facts, another goal must be to increase yields and/or hectarages under cultivation for each active farming household. Prudence would suggest that in the short run a doubling of the per hectare cereals yields (to a mean of 600 per hectare) and the cultivation of at least one-half hectare for each full-time household member would produce the subsistence crop for a household in the most efficient way, given a decision to use a "modified traditional" regime in agriculture.

On the assumption that reliable doubling of the per hectare yields can quickly and economically be achieved, then those among the 30,000 - 40,000 households currently ploughing one-half hectare per member will have to apply the improved packages to extant cultivated hectarage, while those farmers currently ploughing fewer than one-half hectare per household member will have to increase the hectarage under cultivation.

A subsidiary but necessary accompanying goal will be the need to assure farmers that draft power will be available in sufficient numbers and

timely fashion to undertake the cultivation of the hectarages recommended. Subsistence targets plus income targets (see below) will require five to six trek oxen per household.

The larger farmers (those cultivating between 4 and 20 hectare; n = 30,000 - 40,000) may or may not be well advised to devote significant hectarages to cereals crops for subsistence. This decision would depend on the profitability of other (cash) crops and the costs of "buying back" family subsistence at retail prices.

Targets for Income

Income targets for households engaged in agriculture must be set in rotation to income-generating alternatives -- in particular, urban employment and mine labour migration. Revenues from the sale of agricultural surpluses must create returns to labour that approximate in some sense those of formal sector employment.

Using current mine labour remittances, and/or assumptions concerning "expected" wages to be obtained by a household living in town and having two potentially full-time workers, we can calculate that rural farming households must be able to generate from the sale of crops about P300.00 in money earnings (above subsistence costs) in order that they be able to "compete" successfully with towns and/or mines for labour.

The income-producing agricultural activities most practicable for Botswana are: first, cash crops (cowpeas, oil seeds, ground nuts, horticultural crops); second, dairying; third, poultry; fourth, small stock; fifth, cereals.

Each of these could potentially provide the household with a cash surplus of P300.00 suggested as the minimum target. Cash crops (pulses, oil seeds, ground nuts) will require that small farmers bring an additional two to four hectare under cultivation. This implies that the average-sized rural household subsisting through cereal production and producing a cash surplus of about P300 through growing cash crops will have to cultivate about six to eight hectare annually. This is the minimum-sized, viable farming unit. It is more than double the current hectarage cultivated by "median" farmers. Thus, a short-term goal will have to be to expand substantially the land under cultivation and assure its distribution in such fashion that minimum contiguous hectarages of about six to eight can be made available to the more than 70,000 households currently cultivating fewer than eight hectare.

The rate at which these production and income targets can be achieved depends on both will and resources. Rates of increase or decrease in the number of active farming households is difficult to predict, especially since these rates will themselves reflect the scope and scale of government policy implementation itself. If that proportion of the rate of urban increase traceable to rural-out-migration remains constant over the next several years (i.e., about three-fourths of the total urban increase), and the rate of increase due to birth in the rural areas

remains at 3 percent, then there will be in the short run a small increase in the rural population followed by a possible decline in the rural population. Assuming rates of urban increase due to rural outmigration decline, then the rural population in the short run would show some increase over the next several years. Making the middle-of-the-road judgement that the rates of rural-outmigration and the rates of rural increase due to birth will equal each other in the short run, we can presume a rural farming population of nearly constant numbers over the next decade or so. Thus, if 2,000 small-farm households are brought to minimum production and income targets per annum, by the year 2000, 44,000 additional farmers will have reached the set goals. This would equal something less than one-half the total number of farming households. Obviously, if the rate is doubled (to 4,000 households per year), nearly all the farming households will have reached the minimum targets by the year 2000.

Larger farmers can probably be brought to income and production targets more rapidly. For the larger farmers (those currently cultivating between 8 and 20 hectare per annum), the targets should be stated as net returns to land, labour or other scarce production factors. As a first approximation, one could hold the expectation that these larger farmers should be able to derive a net income from cash cropping of 80 to 100 pula per hectare devoted to such crops. Thus, a farmer growing ten hectare of sunflower seeds, ground nuts, or pulses should be expected through efficiencies of his farming system to derive a net income of P800 to P1,000 at current pula purchasing power.

Short-Term Constraints

There are six or seven major constraints to the achievement of the production and income goals suggested in this paper, brief mention only will be made of each.

Draft Power. The country possesses all of the draft power required to achieve its arable production goals. Indeed, draft power presently at hand is adequate to meet the production targets suggested here for the year 2000. Unfortunately, that draft power is distributed in such manner that only a minority of farming households are capable of bringing sufficient hectarage under cultivation so as to grow an annual subsistence crop (in good years). About 50 percent of farming households currently rely on borrowed, hired, or exchanged draft power in some measure. Lack of timely access to draft power appears to be the largest single determinant of the variation in hectarage brought under cultivation. The single biggest determinant of whether a person has timely access to cattle lies in rights of ownership or in long-term holding (mafisa). Farmers holding or owning draft animals cultivate 75 percent more hectarage than those relying on hiring or borrowing of animals. Those households holding six or more oxen plough, on average, double the hectarage of those holding five or fewer oxen. Indeed, it would appear that every farmer must have access to at least four, and probably six, strong, healthy oxen to cultivate the hectarages recommended above in timely fashion. The number of households holding this number are fewer than one-third of the total. One national goal must be to assure farming households of timely access to four to six trek animals (or larger numbers of other animals) usable as draft power.

Land. Land currently under regular or at least intermittent arable regimes totals 1,360,000 hectare. The hectarage cultivated in any one year, however, is no more than 500,000 hectare. The total potentially arable land in Botswana is estimated to be about three to four million hectare. Assuming 80,000 current rural households, this gives an arable hectarage of 17 per household. By the year 2000 there will be at least 100,000 households in rural areas actively engaged in farming. Dividing these into presently arable land, this provides on average 13.6 hectare per household. If 3,000,000 hectare are brought under arable regimes, this gives 30 hectare per household.

While there is sufficient arable land, it must be noted that farming households are not evenly distributed over the available arable land. To achieve the goals described above, movement of households and redistribution of land both will be necessary. In many parts of Botswana there currently exists, in terms of the goals put forward here, a land shortage, or at least a severe land maldistribution. One national goal will have to be rational allocation and reallocation of entitlements to land.

Water. Timely ploughing implies the availability not only of rains, but water for household consumption and for draft animals. While the costs of bringing reliable, clean water supplies to every major lands area would be astronomical, centers for water distribution must be considered essential. Distances that draft animals must travel between winter grazing/watering and sites of cultivation must be reduced. This may require moving water or people or both. The price of the latter is at least as high as the price of the former. It is not clear that permanent settlement in lands areas, induced by provisions of nearby permanent water supplies, will by itself make the contribution of other inputs to agriculture (labour and draft power) more efficient or more effective.

Labour. Hidden underemployment in rural areas, especially among women, is not nearly so great as has recently been estimated. The highly fluctuating or seasonal nature of labour inputs creates severe labour shortages in many areas. Labour sharing arrangements between town and countryside and between households in rural areas remains a crucial means for minimizing seasonal labour shortages. Remittances from wage labour done in towns and mines, as well as regular movement of kin from towns or mines to the countryside, are absolutely necessary features of labour organization. Increasing labour inputs to agriculture will have to come from increasing the returns to agricultural labour. Much of the increased returns to labour will have to be converted to wages with which to hire labour, or entice absent household members back to farming from their sojourns as wage labourers.

Increased Risk to Investment

Increasing average yields, and increasing prices may not be achieved in the short run without increased risk to the farmer. The sources of risk are numerous and cannot be reviewed here. In general, many of the inputs required by so-called modern integrated farming packages are such that if yields fall,

for any reason, below given minima, the losses sustained are much higher than is the case even with crop failure under traditional systems. The capacity of many farmers to sustain even an annual loss of the magnitude possible under modern systems is very limited.

Many Batswana farmers perceive the risks of new practices in light of the adequacy of traditional ones. They do not perceive anticipated risk in light of probable gains. This will make "selling" of modern practices most difficult in relatively bad years, easiest in good years.

Credit and Marketing

Adoption of costly new farming systems is impossible unless reliable, profitable sales can be anticipated. If increased yields cannot be sold at attractive prices, there will be no reason whatever to undertake the increased production in the first place. Moreover, the producer prices paid will have to compensate the farmer for the real costs of the inputs: capital costs, variable costs, and the opportunity costs of labour. Marketing will require, of course, reliable means of storage and transportation.

Credit has played a less important role in arable production than have subventions from sale of labour or stock. If labour currently supporting agriculture by means of wage work is to be returned to primary agricultural production, credit to replace the foregone former wage earnings will become necessary, especially in the short run. What form this credit will take cannot be suggested at this time.

Arable-Package Design

Different regions in the country, different economic classes within the country and within regions have different capabilities and resources usable in developing agriculture. What is feasible -- indeed, desirable -- in one region may be absurd in another. For example, in the Southeast district it is not possible to provide every farming household with eight hectare of arable land. Marketing cash crops grown in Ngamiland is currently going to be very difficult and expensive. Districts must make an important contribution to the design of locally practicable packages. Labour, land, climate, cattle distribution, proximity to markets, and small-scale ecologic variations are but some of the kinds of diversity that policy and farming-systems research must take account of in recommending change in agricultural practice.